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**From:** Ian Hardcastle

**Subject:** US Patent Application 10/071,356

**Attorney Docket:** 10010648-1

**Filed:** February 8, 2002

Enclosed is an Appeal Brief in response to the Office Action dated September 22, 2004.

Respectfully submitted,

Ian Hardcastle  
Reg. No. 34,075

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ATTORNEY DOCKET NO. 10010648-01

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Rene P Helbing

Serial No.: 10/071356

Examiner: Craig H. Curtis

Filing Date: February 8, 2002

Group Art Unit: 2798

Title: An Optical Signal Control Device And Method For Utilizing Same

COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)(1)-(5)) for the total number of months checked below:

<input type="checkbox"/>	one month	\$ 120.00
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<input type="checkbox"/>	four months	\$1590.00

☐ The extension fee has already been filled in this application.

☒ (b) Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account **50-1078** the sum of **\$500.00**. At any time during the pendency of this application, please charge any fees required or credit any overpayment to Deposit Account **50-1078** pursuant to 37 CFR 1.25.

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Typed Name: Linda A. Jimura

Signature: Linda A. Jimura

Respectfully submitted,

Rene P Helbing

By

Ian Hardcastle  
Attorney/Agent for Applicant(s)

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Date: March 14, 2005

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MAR 14 2005

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By Linda A. Jimura Date 3/14/05  
Linda A. Jimura

PATENT  
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS & INTERFERENCES

In re Application of:

Inventor(s): Rene P. Helbing

Group Art Unit: 2798

Serial No.: 10/071,356

Examiner: Craig H. Curtis

Filed: 8 February 2002

Title: *Optical Signal Control Device and Method for Utilizing Same*

Atty Docket: 10010648

BRIEF FOR APPELLANT

Commissioner for Patents  
P.O. Box 1450  
Alexandria  
VA 22313-1450

Sir:

This is an appeal from the decision of the Primary Examiner in a third non-final official action dated 22 September 2004 rejecting claims 2-20, 22-28 and 30-33 in the above-identified patent application.

**I. Real Party in Interest**

The real party in interest is Agilent Technologies, Inc., a Delaware corporation.

**II. Related Appeals and Interferences**

There are no other appeals or interferences known to appellant, the appellant's legal

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representative or the assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

### III. Status of the Claims

The application as originally filed had claims 1-33.

A first official action dated 8 October 2003 (the *first official action*) rejected Claims 1-3, 6, 7, 9, 10, 21 and 29-31 under 35 USC § 102(b) and rejected Claims 4, 5, 8, 11-20, 22-28, 32 and 33 under 35 USC § 103(a).

On 7 January 2004, the applicant filed an amendment in response to the first official action (the *first amendment*). In the first amendment, the applicant cancelled Claims 1, 21 and 29 and amended Claims 2, 7, 9, 10 and 30.

A second, non-final official dated 6 April 2004 (the *second official action*) rejected claims 2-20, 22-28 and 30-33 under 35 USC § 103(a) over various combinations of references all of which included Japanese patent application publication no. JP2000 0056399 of Nishikawa et al. The official action provided the Japanese patent application publication in the form of a Japanese language document with an English language machine translation of the Abstract, notwithstanding the existence of United States patent no. 6,456,359, which claims priority of the same Japanese patent application as Japanese patent application publication no. JP2000 0056399. United States patent no. 6,456,359 issued in September 2002, over 18 months before the mailing date of the second official action.

On 6 July 2004, the applicant filed an amendment in response to the second official action (the *second amendment*). In the second amendment, the applicant traversed the claim rejections but left the claims unchanged. The second amendment indicated that the applicant's arguments set forth therein relating to Nishikawa's disclosure were based on United States patent no. 6,456,359 rather than on the counterpart Japanese patent application publication.

A third, non-final official action dated 22 September 2004 (the *third official action*) rejected claims 2-20, 22-28 and 30-33 under 35 USC § 103(a) over various combinations of references all of which included United States patent no. 6,456,359 of Nishikawa et al. A document comparison showed that the rejections set forth in the third official action were almost

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identical to those set forth in the second official action except that references to Nishikawa's Japanese patent application publication were replaced by references to the counterpart US patent. The identity of the rejections set forth in the third official action to those set forth in the second official action extended to typographical errors in the second official action that the applicant pointed out in the second amendment remaining uncorrected. The third official action additionally subjected claims 2-20, 22-28 and 30-33 to a new obviousness-type double patenting rejection.

The status of the claims on appeal is as follows. The status of each of the claims on appeal is additionally shown in the Claims Appendix.

Claims 1, 21 and 29 have been cancelled.

Claims 2, 7, 9, 10 and 30 were amended.

Claims 3-6, 8, 11-20, 22-28 and 31-33 are original.

Claims 2-4, 6, 7, 9-20 and 30-32 stand rejected under 35 USC § 103(a) as being unpatentable over United States patent no. 6,181,846 of Pan in view of United States patent no. 6,456,359 of Nishikawa et al. (*Nishikawa*).

Claims 5, 8 and 33 stand rejected under 35 USC § 103(a) as being unpatentable over United States patent no. 5,973,831, indicated as being of Pan, in view of Nishikawa and further in view of United States patent no 4,799,768 of Gahan.

Claims 22-28 stand rejected under 35 USC § 103(a) as being unpatentable over United States patent no. 5,930,422 of Cheng in view of Pan and Nishikawa.

Claims 2-20, 22-28, and 30-33 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-15 of United States patent no. 6,690,854 of Helbing.

#### IV. Status of Amendments

No Amendments have been filed since the third official action dated 22 December 2004 was issued.

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**V. Summary of Claimed Subject Matter**

An optical device is claimed in independent Claim 2. Embodiments of such optical device are shown in Figure 5 and Figure 6. The optical device is used to control optical signals. The optical device may be used, for example, as part of a 2 x 2 optical switch, as an optical attenuator or a beam splitter in optical communications applications, in the measurement of optical signals and in other applications.

Referring to Figure 5, optical device (20) comprises a polarization-controlling reflector (30) and a polarization-dependent optical-path device (31-37). The polarization-dependent optical-path device includes an input polarization-dependent path splitting element (31). The polarization-controlling reflector converts spatially-separated incident-light polarization components having a common incident angle of polarization (21I) into spatially-separated reflected-light polarization components having a common reflected angle of polarization (22H). The polarization-controlling reflector has a plurality of states and is controllable such that it can be changed from one of its plurality of states to another of its plurality of states. The common reflected angle of polarization (22H, 24H) has an orientation relative to the common incident angle of polarization (21H, 23H) that is a function of the state of the reflector (30).

Polarization-dependent optical-path device (31-37) converts input-light polarization components (21A, 22A, 23A, 24A) that have been coupled into the optical device (20) and are at least partially spatially-coincident and into spatially-separated input-light polarization components (21A, 22B, 23B, 24B). The polarization-dependent optical-path device (31-37) additionally converts the spatially-separated input-light polarization components into the spatially-separated incident-light polarization components having the common angle of polarization. When polarization-controlling reflector (30) is in a first one of its plurality of states, the above-mentioned orientation is such that the polarization-dependent optical-path device (31-37) causes at least a portion of the reflected-light polarization components to be out-coupled from optical device (20). Input polarization-dependent path splitting element (31) that constitutes part of the polarization-dependent optical-path device (31-37) converts the input-light polarization components that are at least partially spatially-coincident into the spatially-separated input-light polarization components, thus defining a branched input.

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In the optical device claimed in Claim 3, the polarization-dependent optical-path device (31-37) includes an output polarization-dependent path splitting element (38). Prior to the output polarization-dependent optical-path device (38) converting the spatially-separated reflected-light polarization components having a common angle of polarization into the output-light polarization components that are at least partially spatially-coincident, the output polarization-dependent path splitting element (38) converts the spatially-separated reflected light components having the common angle of polarization into spatially-separated reflected-light components having a non-common angle of polarization, thereby defining a branched output. The non-common angle depends on the state of the reflector (30). When the reflector is in the first one of its plurality of states, at least a portion of the output-light polarization components is out-coupled from the optical device (20) through the branched output (22). The portion of the output-light polarization components that is out-coupled from the optical device (20) through the branched output (22) depends on the state of the reflector (30).

In the optical device claimed in Claim 4, when the reflector (30) is in a second one of its plurality of states, at least a portion of the output-light polarization components is out-coupled from the optical device (20) through the branched output (22) and at least a portion of the output-light polarization components is out-coupled from the optical device (20) through the branched input (21). The portion of the output-light polarization components that is out-coupled from the optical device (20) through the branched output and the portion of the output-light polarization components that is out-coupled from the optical device (20) through the branched input (21) depends on the state of the reflector (30).

In the optical device claimed in Claim 5, the plurality of states constitutes a continuum of states such that the optical device (20) functions as an analog optical device (20). The respective portions of output-light polarization components that are out-coupled from the optical device (20) through the branched input (21) and through the branched output (22) is controllably variable over a continuum of the portions by selecting the state of the reflector (30) from the continuum of states.

In the optical device claimed in Claim 8, when the reflector (30) is in a third one of its plurality of states, the optical device (20) functions as a beam splitter and approximately half of

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the output-light polarization components are out-coupled from the optical device through the branched output (22) and approximately half of the output-light polarization components are out-coupled from the optical device through the branched input (21).

An optical device (20) is claimed in independent Claim 11. Embodiments of such optical device are shown in Figure 5 and Figure 6. Referring to Figure 5, the optical device comprises a polarization-controlling reflector (30) and a polarization-dependent optical path (31-37). The reflector converts a first set of spatially-separated incident-light polarization components (21I) having a common incident angle of polarization into a first set of spatially-separated reflected-light polarization components (22H) having a common reflected angle of polarization and converts a second set of spatially-separated incident-light polarization components (23I) having a common incident angle of polarization into a second set of spatially-separated reflected-light polarization components (24H) having a common reflected angle of polarization. The common angle of polarization of the first set of incident-light polarization components (21I) is different from the common angle of polarization of the second set of incident-light polarization components (23I). The common reflected angle of polarization of the first set of spatially-separated reflected-light polarization components (22H) is different from the common reflected angle of polarization of the second set of spatially-separated reflected-light polarization components (24H). The reflector (30) has a plurality of states and is controllable such that it can be changed from one of the states to another of the states. The reflected angles of polarization have orientations relative to their respective incident angles of polarization that are a function of the state of the reflector (30).

The polarization-dependent optical-path device (31-37) has at least a first input port (I1), a first output port (O1), a second input port (I2) and a second output port (O2). The polarization-dependent optical-path device converts a first set of input-light polarization components (21A) that have been coupled into the first input port (I1) of the optical device and are at least partially spatially-coincident into a first set of spatially-separated input-light polarization components (21B) and converts a second set of input-light polarization components (23A, 53A, 53B) that have been coupled into the second input port of the optical device and are at least partially spatially-coincident into a second set of spatially-separated input-light polarization components



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(23B). The polarization-dependent optical-path device (31-37) converts the first set of spatially-separated input-light polarization components (21B) into the first set of spatially-separated incident-light polarization components (21I) and converts the second set of spatially-separated input-light polarization components (23B) into the second set of spatially-separated incident-light polarization components (23I). When the reflector (30) is in a first one of its states, the orientation is such that the polarization-dependent optical-path device causes at least a portion of the first set of reflected-light polarization components (22H) to be out-coupled from the optical device through the first output port (O1).

An integrated optical device is claimed in independent Claim 22. Embodiments of such integrated optical device are shown in Figures 2, 3A and 3B. Referring to Figures 2 3A and 3B, integrated optical device comprises at least a first input port (I1), at least a first output port (O1), a substantially non-reciprocal directional stage (25), a reflective element (30) and a polarization stage (26) interposed between the directional stage and the reflective element. The directional stage comprises one or more elements that are configured to operate on polarization components of light, the directional stage receiving light from at least the first input port, the received light having polarization components, the directional stage controlling a path of propagation of the received light through the directional stage by operating on the polarization components of the received light. The reflective element (30) has a plurality of states such that light impinging on the reflective element is reflected by the reflective element with a polarization that depends on the state of the reflective element. The polarization stage (26) directs the polarization components of light propagating through the directional stage onto the reflective element by operating on the polarization components of the light received by the polarization stage from the directional stage, and wherein the polarization stage directs light components reflected from the reflective element into the directional stage with a polarization that depends on the state of the reflective element to enable the directional stage to control the path of propagation of the reflected light based on the polarization of the reflected light components.

A method for operating on light is claimed in Claim 30. An embodiment of the method is performed by the optical device shown in Figure 5. Referring to Figure 5, in the method, an optical device (20) is provided having a polarization-dependent optical path device (31-37) and a

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controllable reflective element (30) that has a plurality of states. Input light is coupled into the optical device (20). The polarization-dependent optical path device (31-37) is used to separate the input light into spatially-separated input-light polarization components. The polarization-dependent optical path device (31-37) is used to provide the polarization components with a common incident angle of polarization and to direct the polarization components onto the reflective element (30). The reflective element (30) is placed in one of its states in which the reflective element (30) reflects the input light polarization components incident thereon to produce reflected-light polarization components that have a common reflected angle of polarization. The common reflected angle of polarization depends on the one of its states into which the reflective element (30) has been placed. The polarization-dependent optical path device (31-37) is used to combine the reflected-light polarization components, and the combined reflected-light polarization components are out-coupled from the optical device (20).

#### **VI. Grounds of Rejection to be Reviewed on Appeal**

A. Is the rejection of Claims 2-4, 6, 7, 9-20 and 30-32 under 35 USC § 103(a) as being unpatentable over United States patent no. 6,181,846 of Pan in view of United States patent no. 6,456,359 of Nishikawa et al. (*Nishikawa*) proper?

B. Is the rejection of Claims 5, 8 and 33 under 35 USC § 103(a) as being unpatentable over United States patent no. 5,973,831, indicated as being of Pan, in view of Nishikawa and further in view of United States patent no 4,799,768 of Gahan proper?

C. Is the rejection of Claims 22-28 under 35 USC § 103(a) as being unpatentable over United States patent no. 5,930,422 of Cheng in view of United States patent no. 5,973,831, indicated as being of Pan, and Nishikawa proper?

D. Is the rejection of Claims 2-20, 22-28, and 30-33 under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims 1-15 of United States patent no. 6,690,854 of Helbing proper?

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**VII. Argument****1. CLAIM REJECTIONS UNDER 35 USC § 103(a)**

Claims 2-20, 22-28 and 30-33 are all rejected under 35 USC § 103(a). With reference to rejections under 35 USC § 103(a), MPEP § 2143 states: "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

The applicant respectfully submits that the rejection of Claims 2-20, 22-28 and 30-33 under 35 USC § 103(a) is improper because the *prima facie* case of obviousness set forth in the official actions does not comply with the requirements set forth in MPEP § 2143. The individual claim rejections under 35 USC § 103(a) will now be discussed in detail.

*A. Is the rejection of Claims 2-4, 6, 7, 9-20 and 30-32 under 35 USC § 103(a) as being unpatentable over United States patent no. 6,181,846 of Pan in view of United States patent no. 6,456,359 of Nishikawa et al. (Nishikawa) proper?*

Claims 2-4, 6, 7, 9-20, and 30-32 stand rejected under 35 USC § 103(a) as being unpatentable over Pan in view of Nishikawa. The applicant respectfully submit that the rejection of Claims 2-4, 6, 7, 9-20 and 30-32 is improper on the grounds that (1) the proposed combination of references is improper, and (2) the proposed combination of references does not teach all the claim limitations recited in Claims 2-4, 6, 7, 9-20 and 30-32.

Pan discloses a fiberoptic liquid crystal on-off switch and variable attenuator in which the end facets of two optical fiber cores (10, 11) in a sleeve (12)(see Figure 3A), a birefringent crystal (15), a quarter-pitch GRIN lens (16), a liquid crystal cell (18) and a mirror element (19) are arranged and oriented with respect to each other so that light from the first optical fiber core

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passes through, and back from, the first birefringent crystal, the GRIN lens, the liquid crystal cell and the mirror element into the second optical fiber core when the liquid crystal cell is in a first state. When the liquid crystal cell is in an opposite second state, light from the first optical fiber core passes through, and back from, the first birefringent crystal, the GRIN lens, the liquid crystal cell and the mirror element, but not into the second optical fiber core. (Abstract, reference numerals added).

Nishikawa discloses a photographic printer for printing photographs from digital files on photographic paper. Nishikawa's photographic printer uses a polarizing beam splitter 3 to transmit the P polarization component of the light generated by source 1 and color wheel 2. The polarizing beam splitter discards the orthogonal S polarization component. The P polarization component then passes through a quarter-wave plate 4 to digital micromirror device (DMD) 5. Depending on its state (ON or OFF), each pixel of DMD 5 either retroreflects the portion of the polarization component incident on it back to quarter-wave plate 4 or reflects the portion of the polarization component incident on it laterally with respect to the optical path. The quarter wave plate converts the retroreflected portions of the P polarization component to corresponding portions of an S polarization component. Polarizing beam splitter 3 reflects the S polarization component orthogonally to the direction of the P polarization component towards a printing lens 7 and photographic paper 6.

1. The Proposed Combination of Pan and Nishikawa is Improper

The applicant respectfully submits that the rejection of Claims 2-4, 6, 7, 9-20 and 30-32 is improper because the combination of Pan and Nishikawa proposed in the official action and on which the rejection is based is improper. The applicant respectfully submits that the proposed combination of Pan and Nishikawa is improper because (a) the official action does not set forth a motivation and a reasonable expectation of success that meets the legal requirements summarized in MPEP § 2143, and (b) the proposed combination changes the principles of operation of Pan's fiberoptic liquid crystal switch.

(a) The official action indicates that Pan does not disclose the polarization controlling reflector recited in the claims and looks to Nishikawa for a disclosure of the missing element.

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The official action states:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the invention of Pan such that it further comprise said polarization-controlling reflector explicitly taught by Nishikawa et al., for at least the purpose of controlling the polarization state of light traversing said optical device.

The applicant respectfully submits that the motivation for combining the references set forth in the official action does not meet the requirements set forth in MPEP § 2143. The official action does not indicate where the motivation set forth therein may be found in the cited references. The applicant has been unable to find anything in the cited references that teaches or suggests the motivation set forth in the official action. Specifically, the applicant been unable to find anything in Pan's disclosure that indicates that control of the polarization state in Pan's fiberoptic liquid crystal switch is in any way inadequate. Finally, the applicant has been unable to find anything in the cited references that could properly be regarded as providing a motivation that complies with the legal requirements summarized in MPEP § 2143. Without a teaching or suggestion in the cited references that would provide a motivation for a person of ordinary skill in the art to combine the references, the proposed combination of references is improper.

Moreover, the official action does not indicate where in the cited references can be found a teaching or suggestion that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to modify Pan's fiberoptic liquid crystal switch in the manner proposed in the official action. The applicant has been unable to find teaching or suggestion in the cited references that could properly be regarded as providing a reasonable expectation of success that complies with the legal requirements summarized in MPEP § 2143. Without a teaching or suggestion in the cited references that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to combine the references, the proposed combination of references is improper.

(b) "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)" (MPEP § 2143.01)

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The applicant respectfully submits that the proposed combination changes the principles of operation of Pan's fiberoptic liquid crystal switch. Pan clearly shows two orthogonal polarization components traversing his device. Pan's Figures 3B and 3C show the two polarization components represented by solid and broken lines, respectively. Nishikawa explicitly teaches passing only one of the polarization components of the light generated by source 1 through polarizing beam splitter 3 in the first pass (col. 4, lines 5 and 6). The other polarization component is discarded. Combining Nishikawa's photographic printer with Pan's fiberoptic liquid crystal switch would change the principle of operation of Pan's fiberoptic liquid crystal switch because only one polarization component would pass through the combination in accordance with the teaching of Nishikawa. The fraction of incident light passing through the modified version of Pan's fiberoptic liquid crystal switch would depend on the polarization state of the incident light, whereas this fraction is independent of the polarization state of the incident light in Pan's original fiberoptic liquid crystal switch.

Accordingly, the applicant respectfully submits that the rejection of Claims 2-4, 6, 7, 9-20 and 30-32 is improper because the proposed combination of Pan and Nishikawa on which the rejection is based is improper for the reasons just stated.

2. The Proposed Combination of References Does Not Teach All The Claim Limitations Recited in Claims 2-4, 6, 7, 9-20 and 30-32

The applicant respectfully submits that the rejection of Claims 2-4, 6, 7, 9-20 and 30-32 is improper because the proposed combination of references neither teaches nor suggests all the claim limitations recited in Claims 2-4, 6, 7, 9-20 and 30-32. To establish a proper prima facie case of obviousness, the proposed combination of references neither teaches nor suggests all the claim limitations recited in Claims 2-4, 6, 7, 9-20 and 30-32 (MPEP § 2143, quoted above).

(a) Claim 2

As noted above, the official action indicates that Pan does not disclose the polarization controlling reflector recited in claim 2 and looks to Nishikawa for a disclosure of the missing element. The official action alleges that Nishikawa discloses a polarization controlling reflector

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in Figures 1, 3, 4(a) and 4(b). The applicant respectfully disagrees with the reading of Nishikawa's disclosure set forth in the official action. The applicant respectfully submits that (i) Nishikawa does not disclose a polarization-controlling reflector as recited in claim 2, and (ii) Pan does not disclose an input polarization-dependent path splitting element that defines a branched input, also as recited in claim 2.

**(i) Nishikawa Does Not Disclose the Polarization-Controlling Reflector**

The applicant respectfully submits that the rejection of claim 2 is improper for the additional reason that Nishikawa's disclosure neither teaches nor suggests: "a polarization-controlling reflector, said reflector converting incident-light polarization components having incident angles of polarization into reflected-light polarization components having reflected angles of polarization, said reflector having a plurality of states, and being controllable such that said reflector can be changed from one of said plurality of states to another of said plurality of states, said reflected angles of polarization having an orientation relative to said incident angles of polarization, said orientation being a function of the state of the reflector," as recited in Claim 2.

The official action does not indicate a specific element of Nishikawa's photographic printer as corresponding to the polarization-controlling reflector recited in claim 2. In the Amendment filed on 6 July 2004 in response to the second official action, the applicant indicated that he would therefore assume that the Examiner regards Nishikawa's entire photographic printer shown in Figures 1, 3, 4(a) and 4(b) as corresponding to the polarization-controlling reflector recited in the applicant's claim 2. The Examiner did not traverse this assumption in the third official action.

Nishikawa's photographic printer has a single, fixed operational state in which it simply selects one fixed polarization component of the light generated by source 1 and additionally converts all of the polarization component reflected by DMD 5 to the fixed orthogonal polarization state that is reflected by polarizing beam splitter 3. Accordingly, Nishikawa's photographic printer cannot be accurately described as having "plurality of states" and being "controllable such that said reflector can be changed from one of said plurality of states to

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another of said plurality of states, said reflected angles of polarization having an orientation relative to said incident angles of polarization, said orientation being a function of the state of the reflector," as recited in Claim 2. Moreover, the applicant has been unable to find any teaching in Nishikawa's disclosure that teaches or suggests that the polarization state of the polarization state of the polarization component reflected by Nishikawa's DMD 5 changes depending on the state (ON or OFF) of the DMD.

The applicant further submits that Pan does not disclose this element missing from the proposed combination of references.

**(ii) Pan Does Not Disclose an Input Polarization-Dependent Path Splitting Element That Defines a Branched Input**

The applicant respectfully submits that the rejection of claim 2 is improper for the additional reason that Pan's disclosure neither teaches nor suggests: "an input polarization-dependent path splitting element, said input polarization-dependent path splitting element converting said input light polarization components that are at least partially spatially coincident into said spatially-separated input-light polarization components, thereby defining a branched input," as recited in Claim 2. The applicant has been unable to find anything in the official action that indicates which element of Pan's fiberoptic liquid crystal switch corresponds to this element of Claim 2. Moreover, the applicant respectfully submits that neither Pan nor Nishikawa discloses such an element. Pan's birefringent element 15 converts input-light polarization components that are at least partially spatially coincident into spatially-separated input-light polarization components, as depicted in Figures 3B and 3C. However, the applicant respectfully submits that the conversion of input light polarization components that are at least partially spatially coincident into spatially-separated input-light polarization components, as performed by birefringent element 15, does not constitute polarization-dependent path splitting that might allow the birefringent element to be described as an input polarization-dependent path splitting element that defines a branched input, as recited in claim 2. Contrast Pan's Figures 3B and 3C with Figure 2 of the application.

That Pan's fiberoptic liquid crystal switch lacks an input polarization-dependent path



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splitting element that defines a branched input is additionally evident from the number of input paths and output paths in Pan's fiberoptic liquid crystal switch that are related in the sense that light can pass from one to the other. Pan's fiberoptic liquid crystal switch has only a single input path provided by one of the two fibers 10 and 11. The other of the fibers 10 and 11 constitutes a single, non-branched output. Even in the two-channel embodiment shown in Pan's Figure 7, each channel has only a single input path and a single output path between which light can pass. In this two-channel embodiment, light can pass between opposite fibers, but cannot pass between adjacent fibers (see col. 6, lines 40-58 of Pan). Thus, none of Pan's fiberoptic liquid crystal switches can accurately be said to have a branched input (or a branched output). Pan's Figure 7 embodiment will be discussed further below with reference to claims 4 and 11.

The applicant therefore respectfully submits that the proposed combination of references neither teaches nor suggests (i) the polarization-controlling reflector and (ii) the input polarization-dependent path splitting element path that defines a branched input recited in claim 2. Accordingly, the applicant respectfully submits that the rejection of claim 2 is improper because the proposed combination of references does not teach or suggest all the claim limitations recited in claim 2.

(b) Claims 3, 4, 6, 7, 9 and 10

The applicant respectfully submits that the rejection of Claims 3, 4, 6, 7, 9 and 10 that depend on Claim 2 is improper on the grounds that the prima facie case of obviousness set forth in the official action with respect to Claims 3, 4, 6, 7, 9 and 10 does not comply with the requirements set forth in MPEP § 2143. The applicant respectfully submits that the rejection of Claims 3, 4, 6, 7, 9 and 10 is improper at least because the proposed combination of Pan and Nishikawa on which the rejection of Claims 3, 4, 6, 7, 9 and 10 is based is improper for the reasons stated above. Additionally, the applicant respectfully submits that the rejection of Claims 3, 4, 6, 7, 9 and 10 is improper at least because the proposed combination of Pan and Nishikawa neither teaches nor suggests all the claim limitations recited in Claims 3, 4, 6, 7, 9 and 10, also for the reasons set forth above with reference to Claim 2.

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## (i) Claims 3, 6 and 7

The applicant respectfully submits that the rejection of claims 3, 6 and 7 is improper for the additional reason that the proposed combination of Pan and Nishikawa neither teaches nor suggests all of the claim limitations recited in Claim 3 and, hence, in Claims 6 and 7 that depend on Claim 3. Specifically, the applicant respectfully submits that Pan does not disclose an output polarization-dependent path splitting element that defines a branched output, as recited in Claim 3.

The official action indicates that Pan's element 16 corresponds to the output polarization-dependent path splitting element recited in Claim 3. Pan describes his element 16 as a GRIN lens (col. 2, line 60). GRIN lenses are typically polarization-independent devices. The applicant has been unable to find any teaching or suggestion in Pan's disclosure indicates that Pan's element 16 has polarization-dependent properties. Thus, the applicant respectfully submits that it would be inaccurate to describe Pan's GRIN lens as "polarization-dependent." Moreover, Pan describes his GRIN lens 16 as collimating the polarization components output by birefringent crystal 15 (col. 3, lines 51-52). GRIN lens 16 additionally images the polarization components reflected by mirror element 19 at birefringent crystal 15. The applicant respectfully submits that the collimating and imaging performed by Pan's GRIN lens 16 does not constitute polarization-dependent path splitting that might allow the GRIN lens to be accurately called an output polarization-dependent path splitting element that defines a branched output, as recited in claim 3. This can be seen by comparing Pan's Figures 3B and 3C with Figure 2 of the application.

That Pan's fiberoptic liquid crystal switch lacks a polarization-dependent path splitting element that defines a branched output is evident from the number of input paths and output paths in Pan's fiberoptic liquid crystal switch that are related in the sense that light can pass from one to the other. Pan's fiberoptic liquid crystal switch has only a single input path provided by one of the two fibers 10 and 11. The other of the fibers 10 and 11 constitutes a single, non-branched output. Note that, even in the two-channel embodiment shown in Pan's Figure 7, each channel has only a single input path and a single output path between which light can pass. Light can pass between opposite fibers, but cannot pass between adjacent fibers in this embodiment.

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Thus, none of Pan's embodiments can accurately be said to have a branched output (or a branched input).

The applicant further submits that Nishikawa does not supply any of the elements missing from the proposed combination of references.

Accordingly, the applicant respectfully submits that the rejection of Claim 3 and of Claim 6 and Claim 7 that depend on Claim 3 is improper for this additional reason.

(ii) Claim 4

The applicant respectfully submits that the rejection of claim 4 is improper for the additional reason that the proposed combination of references does not teach or suggest all the claim limitations recited in claim 4. The applicant respectfully submits that no location exists in Pan's fiberoptic liquid crystal switch where one of Pan's additional optical fibers could be located to receive both polarization components in the OFF state of Pan's fiberoptic liquid crystal switch, as would be required for the proposed combination of references to teach or suggest all the claim limitations recited in Claim 4. Pan's Figure 3C clearly shows the two polarization components arriving at spatially-separated locations both spatially offset from fiber 11. The applicant further submits that Nishikawa does not disclose any of the elements missing from the proposed combination of references.

Moreover, the applicant notes that Pan discloses an embodiment with four optical fiber cores as shown in Figures 7, 8A and 8B. However, Pan explicitly teaches that pairs of the optical fiber cores operate independently, see, e.g., col. 6, lines 40-58. Pan's Figure 7 embodiment is simply two, independent fiberoptic liquid crystal switches that use a common birefringent element, a common GRIN lens and a common liquid crystal element. Pan teaches "light can travel between the fibers 50 and 51, and between the fibers 52 and 53 when the liquid crystal cell 68 is in the ON state. When the liquid crystal cell 68 is OFF, no light travels between any of the optical fibers." The applicant respectfully submits that this portion of Pan's disclosure teaches away from out-coupling the output polarization components through more than one optical fiber and that the proposed modification of Pan's fiberoptic liquid crystal switch is improper for this additional reason.

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Accordingly, the applicant respectfully submits that the rejection of Claim 4 is improper for this additional reason.

(c) Claim 11

The applicant respectfully submits that the rejection of claim 11 is improper on the grounds that the combination of Pan and Nishikawa is improper for the reasons stated above with reference to Claim 2, the combination of Pan and Nishikawa does not teach or suggest all the claim limitations recited in Claim 11, for reasons similar to those set forth above with reference to Claim 2, and because the additional modification of Pan's fiberoptic liquid crystal switch is improper.

The official action indicates that Pan's embodiment shown in Figures 3A and 3B does not disclose a polarization-dependent optical-path device that has at least a second input port and a second output port in addition to the disclosed first input port (10) and the first output port (11) and looks to Pan's Figures 7, 8A and 8B for a disclosure of a second input port and a second output port. The official action states:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the optical device of Pan depicted in Figs. 3B & 3C therein such that at least a portion of said output light polarization components be outcoupled from the optical device through said branched input, as well as such that said optical device further comprise a second input port and a second output port, both being taught by Pan in the embodiment of said optical device depicted in Fig. 7 therein, for at least the purposes of increasing the functionality of said optical device by allowing said output-light polarization components to be out-coupled from said optical device through more than one optical fiber, as well as allowing more than one set of input-light polarization components to be in-coupled to said device.

The applicant respectfully submits that the motivation for modifying the proposed combination of references set forth in the official action does not meet the requirements set forth in MPEP § 2143. The official action does not indicate where the motivation set forth therein may be found in the cited references. The applicant has been unable to find anything in the cited references that teaches or suggests the motivation set forth in the official action. Specifically, the applicant has been unable to find anything in Pan's disclosure that indicates that it would be desirable for Pan's fiberoptic liquid crystal switch to have the ability to out couple output-light polarization components through more than one optical fiber, or that it would be desirable for

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Pan's fiberoptic liquid crystal switch to allow more than one set of input-light polarization components to be in-coupled. Finally, the applicant has been unable to find anything in the cited references that could properly be regarded as providing a motivation that complies with the legal requirements summarized in MPEP § 2143. Without a teaching or suggestion in the cited references that would provide a motivation for a person of ordinary skill in the art to combine the references, the proposed combination of references is improper.

Moreover, the official action does not indicate where in the cited references can be found a teaching or suggestion that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to modify Pan's fiberoptic liquid crystal switch in the manner proposed in the official action. The official action provides no indication of where in the cited references may be found a teaching that would indicate the structural modifications needed to accomplish the proposed functional modification to Pan's fiberoptic liquid crystal switch. The applicant has been unable to find teaching or suggestion in the cited references that could properly be regarded as providing a reasonable expectation of success that complies with the legal requirements summarized in MPEP § 2143. Without a teaching or suggestion in the cited references that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to combine the references, the proposed combination of references is improper.

The applicant respectfully submits that the proposed combination of references is improper with respect to Claim 11 for the additional reason that the proposed further modification of Pan's fiberoptic liquid crystal switch would change the principles of operation of Pan's fiberoptic liquid crystal switch. Pan's Figures 3C clearly shows the two polarization components arriving at spatially-separated locations both spatially offset from fiber 11. For Pan's fiberoptic liquid crystal switch to have the function proposed in the official action, the polarization components would have to arrive at a common point in the official action, contrary to Pan's teaching.

(i) Claims 12-20

The applicant respectfully submits that the rejection of Claims 12-20 that depend on

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Claim 11 is improper on the grounds that the *prima facie* case of obviousness set forth in the official action with respect to Claims 12-20 does not comply with the requirements set forth in MPEP § 2143. The applicant respectfully submits that the rejection of Claims 12-20 is improper at least because the modification of the proposed combination of Pan and Nishikawa on which the rejection of Claims 12-20 is based is improper for the reasons stated above. Additionally, the applicant respectfully submits that the rejection of Claims 12-20 is improper at least because the proposed combination of Pan and Nishikawa neither teaches nor suggests all the claim limitations recited in Claims 12-20 also for the reasons set forth above with reference to Claim 11.

The applicant respectfully submits that the rejection of claims 12-20 is improper for the additional reason the official action does not even attempt to establish a *prima facie* case of obviousness with respect to these claims. The official action does not indicate elements disclosed in the proposed combination of references that are alleged to teach or suggest every claim limitation recited in claims 12-20. The official action simply states: "it is submitted that--once account is taken of the various permutations of operation (express or implied) of the embodiment of the optical device depicted in Fig. 7 of Pan--the disclosures [sic] of Pan encompass the limitations recited in each of these claims."

(d) Claims 30 and 31

A rejection purporting to reject Claims 28-31 is set forth in Section 1 of the third official action. The heading of Section 1 does not mention Claim 28. Claim 28 is rejected in Section 3 of the third official action. Moreover, the applicant cancelled Claim 29 in the first amendment. Accordingly, this portion of this Appeal Brief will discuss only the rejection of Claims 30 and 31.

The applicant respectfully submits that the rejection of claims 30 and 31 is improper for the additional reason the official action does not even attempt to establish a *prima facie* case of obviousness with respect to these claims. The official action does not indicate which elements disclosed in the proposed combination of references correspond to the claim limitations recited in claims 30 and 31. The official action simply states: "the structural teachings of Pan implicitly

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meet the method step limitations recited in [claims 30 and 31]. See above and 3B & 3C.” Nishikawa is not mentioned in the rejection.

In case the reference to “implicitly” is intended to refer to “inherently,” the applicant respectfully submits that the official action does not establish a proper *prima facie* case of inherency. To establish a *prima facie* case of inherency, the extrinsic evidence “must make clear that the missing descriptive matter is *necessarily present* in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991). “Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *Id.* at 1269, 20 USPQ2d at 1749 (quoting *In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981). *In re Robertson*, 49 USPQ2d 1949, 1950-51 (CAFC, 1999). The possible assertion of inherency set forth in the official action does not meet this legal standard: no extrinsic evidence is set forth to indicate that the elements possibly alleged to be inherent are “necessarily present in the thing described in the reference.”

The applicant further submits that the rejection of claims 30 and 31 is also improper for the additional reason that the proposed combination of references does not teach or suggest all the claim limitations recited in claims 30 and 31. Specifically, the proposed combination of references does not disclose “providing ... an input polarization-dependent path splitting element, the input polarization-dependent path splitting element spatially separating said input-light polarization components to obtain said spatially-separated input-light polarization components, thereby defining a branched input,” “providing ... a controllable reflective element that has a plurality of states,” “using the polarization-dependent optical path device to separate the input light into spatially-separated input-light polarization components,” and the method elements that use these structural elements for reasons similar to those set forth above with reference to Claim 2.

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## (e) Claim 32

The applicant respectfully submits that the rejection of claim 32 is improper for the additional reason the official action does not even attempt to establish a *prima facie* case of obviousness with respect to this claim. The official action does not indicate elements disclosed in the proposed combination of references that are alleged to teach or suggest every claim limitation recited in claim 32. The official action simply states: "it is submitted that--once account is taken of the various permutations of operation (express or implied) of the embodiment of the optical device depicted in Fig. 7 of Pan--the disclosures [sic] of Pan encompass the limitations recited in [claim 32]."

*B. Is the rejection of Claims 5, 8 and 33 stand rejected under 35 USC § 103(a) as being unpatentable over United States patent no. 5,973,831, indicated as being of Pan, in view of Nishikawa and further in view of United States patent no 4,799,768 of Gahan proper?*

In the first official action mailed on 8 October 2003, claims 5, 8 and 13 were rejected under 35 USC § 103(a) as being unpatentable over "United States patent no. 5,973,831 of Pan in view of United States patent no 4,799,768 of Gahan." In the first amendment, the applicant noted that United States patent no. 5,973,831 was entitled *Systems for Three-Dimensional Viewing Using Light Polarizing Layers* and was issued to Kleinberger, not to Pan, and indicated that he would assume that claims 5, 8 and 33 were rejected over United States patent no. 6,181,846 of Pan in view of United States patent no. 4,799,768 of Gahan. The Examiner did not traverse this assumption in the subsequent official actions.

First, the applicant respectfully submits that the rejection of Claims 5 and 8, dependent on Claim 2, and Claim 13, dependent on Claim 11, is improper on the grounds that the *prima facie* case of obviousness set forth in the official action with respect to Claims 5, 8 and 13 does not comply with the requirements set forth in MPEP § 2143. The applicant respectfully submits that the rejection of Claims 5, 8 and 13 is improper at least



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because the proposed combination of Pan and Nishikawa on which the rejection of Claims 5, 8 and 13 is based is improper for the reasons stated above with reference to Claim 2 and Claim 11. Additionally, the applicant respectfully submits that the rejection of Claims 5, 8 and 13 is improper at least because the proposed combination of Pan and Nishikawa on which the rejection is based neither teaches nor suggests all the claim limitations recited in Claims 5, 8 and 13, also for the reasons set forth above with reference to Claim 2 and Claim 11.

Additionally, the applicant respectfully submits that the rejection of Claims 5, 8 and 13 is improper for the additional reason that the proposed combination of Pan, Nishikawa and Gahan is improper. The applicant respectfully submits that the proposed combination of Pan, Nishikawa and Gahan is improper because (a) the motivation set forth in the third official action to combine the references does not conform with the requirements set forth in MPEP § 2134, and the third official action sets forth no reasonable expectation of success, (b) the proposed further modification of Pan's modified fiberoptic liquid crystal switch proposed in the official action would render Pan's fiberoptic liquid crystal switch inoperable for its stated purpose, and (c) Gahan is non-analogous art.

(a) The applicant respectfully notes that the official action does not indicate where in the cited references may be found the motivation set forth in the official action to further modify Pan's modified fiberoptic liquid crystal switch in the manner proposed in the official action. The applicant has been unable to find in the cited references either the stated motivation or another teaching or suggestion that could reasonably be regarded as complying with the requirements set forth in MPEP § 2143. Accordingly, the applicant respectfully submits that the motivation set forth in the official action is improper.

The applicant further notes that the official action does not indicate where in the cited references may be found a teaching or suggestion that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to further modify Pan's modified fiberoptic liquid crystal switch in the

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manner proposed in the official action. The applicant has been unable to find such teaching or suggestion in the cited references.

Accordingly, the applicant respectfully submits that the rejection of claims 5, 8 and 13 is improper because the official action does not set forth a motivation and a reasonable expectation of success that comply with the requirements set forth in MPEP § 2143.

(b) The applicant respectfully submits that the proposed further modification of Pan's modified fiberoptic liquid crystal switch is improper because it would render Pan's fiberoptic liquid crystal switch inoperable for its stated purpose. The applicant notes that Pan teaches that his mirror element 19 is "highly reflective" (col. 2, line 66). The official action states that Gahan discloses a reflector with multiple states of reflectivity. A reflector with multiple states of reflectivity would not comply with Pan's description of such element being "highly reflective," at least in some of its states.

(c) The applicant respectfully submits that the proposed combination of references is improper because Gahan is not analogous prior art, and hence, is not a valid reference with respect to claims 5, 8 and 13. Gahan is directed to a rear-view mirror for automotive applications. The applicant's invention is directed to a microminiature optical switch or attenuator. It should be noted that Pan, which is analogous prior art, and Gahan are in different classifications and had entirely different fields of search during their prosecution.

*C. Is the rejection of Claims 22-28 under 35 USC § 103(a) as being unpatentable over United States patent no. 5,930,422 of Cheng in view of Pan and Nishikawa proper?*

Claims 22-28 stand rejected under 35 USC § 103(a) as being unpatentable over United States patent no. 5,930,422 of Cheng in view of United States patent no. 5,973,831, indicated as being of Pan, and Nishikawa. Again, the Examiner has not traversed the applicant's assumption that the reference to "United States patent no. 5,973,831 of Pan" in the rejection of Claims 22-28 is intended to be a reference to United

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States patent no. 6,181,846 of Pan. The applicant respectfully submits that the rejection of claims 22-28 is improper on the grounds that (1) the proposed combination of references is improper, and (2) the proposed combination of references does not teach all the claim limitations recited in Claims 22-28.

Cheng discloses an optical circulator comprising three optical waveguides (8a, 8b, 8c) disposed along side one another at an input end adjacent a thin birefringent crystal (10) to which they are optically coupled. The circulating device also includes at a distal end, a mirror (20) for reflecting light backwards and providing a folded configuration. Located between the birefringent crystal and the mirror are, in order, four half waveplates 12a-12d, a Faraday rotator 14, and a second birefringent crystal 16.

**1. The Proposed Combination of Cheng, Pan and Nishikawa is Improper**

The applicant respectfully submit that the proposed combination of Pan and Nishikawa is improper because (a) the official action does not set forth a motivation and a reasonable expectation of success that meets the legal requirements summarized in MPEP § 2143, and (b) the proposed modification of Cheng's optical circulator would render Cheng's optical circulator inoperable for its stated purpose.

The official action indicates that Cheng does not disclose (i) a reflective element with a plurality of states such that light impinging on the reflective element is reflected by the reflective element with a polarization that depends on the state of the reflective element and (ii) a polarization stage that directs light components reflected from the reflective element into the directional stage with a polarization that depends on the state of the reflective element to enable the directional stage to control the path of propagation of the reflected light based on the polarization of the reflected light components. The official action looks to Pan for a disclosure of the missing elements. The official action states:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the optical device of Cheng such that its reflective element have a plurality of states such that light impinging on the reflective element be reflected by the reflective element with a polarization that depends on the state of the reflective

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element, as taught by Pan, for at least the purpose of providing increased directional control of said polarization components of light propagating through said optical device.

The applicant respectfully submits that the motivation for combining the references set forth in the official action does not meet the requirements set forth in MPEP § 2143. The official action does not indicate where in the cited references may be found a teaching or suggestion that would provide a motivation for the person of ordinary skill in the art to modify Chang's optical circulator in the manner proposed in the official action. The applicant has been unable to find anything in the cited references that teaches or suggests the motivation set forth in the official action. Specifically, the applicant been unable to find anything in Cheng's disclosure that indicates that directional control of the polarization components of light propagating through Cheng's optical circulator is in any way inadequate. Finally, the applicant has been unable to find anything in the cited references that could properly be regarded as providing a motivation that complies with the legal requirements summarized in MPEP § 2143. Without a teaching or suggestion in the cited references that would provide a motivation for a person of ordinary skill in the art to combine the references, the proposed combination of references is improper.

Moreover, the official action does not indicate where in the cited references can be found a teaching or suggestion that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to modify Cheng's optical circulator in the manner proposed in the official action. The applicant has been unable to find teaching or suggestion in the cited references that could properly be regarded as providing a reasonable expectation of success that complies with the legal requirements summarized in MPEP § 2143. Without a teaching or suggestion in the cited references that would provide a person of ordinary skill in the art with a reasonable expectation of success in the event such person were to attempt to combine the references, the proposed combination of references is improper.

(b) Chang discloses an optical circulator. The applicant respectfully submits that the proposed modification of Chang's optical circulator would render Chang's optical circulator inoperable for its stated purpose. This is because, in some states of a reflective

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element with a plurality of states, the modified device would not transfer light from one port to the next, and would therefore fail to function as an optical circulator. The applicant respectfully submits that the proposed modification of Chang's device is improper for this additional reason.

2. The Proposed Combination of References Does Not Teach All The Claim Limitations Recited in Claims 22-28

The applicant respectfully submits that the rejection of Claims 22-28 is improper because the proposed combination of references neither teaches nor suggests all the claim limitations recited in Claims 22-28. To establish a proper prima facie case of obviousness, the proposed combination of references neither teaches nor suggests all the claim limitations recited in Claims 22-28 (MPEP § 2143, quoted above).

(a) Claim 22

The official action indicates that Cheng does not disclose (i) a reflective element with a plurality of states such that light impinging on the reflective element is reflected by the reflective element with a polarization that depends on the state of the reflective element and (ii) a polarization stage that directs light components reflected from the reflective element into the directional stage with a polarization that depends on the state of the reflective element to enable the directional stage to control the path of propagation of the reflected light based on the polarization of the reflected light components. The official action looks to Pan for a disclosure of the missing elements.

The applicant respectfully submits that Cheng's optical circulator and, hence, the proposed combination of references, lacks an element that can accurately be described as "a polarization stage interposed between the directional stage and the reflective element, the polarization stage directing the polarization components of light propagating through the directional stage onto the reflective element by operating on the polarization components of the light received by the polarization stage from the directional stage, and

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wherein the polarization stage directs light components reflected from the reflective element into the directional stage with a polarization that depends on the state of the reflective element to enable the directional stage to control the path of propagation of the reflected light based on the polarization of the reflected light components," as recited in claim 22. The official action states that Cheng's element 18 corresponds to such polarization stage. However, Cheng discloses that his element 18 is a lens, specifically a GRIN lens (col. 5, lines 16 and 17). The applicant respectfully submits that a GRIN lens has none of the above-quoted properties of the polarization device. Moreover, the applicant has been unable to find any teaching in Cheng's disclosure that would indicate that Cheng's element 18 has such properties. Accordingly, the applicant respectfully submits that, since the proposed combination of references lacks an element that can accurately be described the polarization device recited in claim 22, the proposed combination of references neither teaches nor suggests all the claim limitations recited in Claim 22. The applicant therefore respectfully submits that the rejection of claim 22 is improper.

Additionally, the applicant respectfully submits that Pan's fiberoptic liquid crystal switch modified as proposed in the official action to incorporate Nishikawa's photographic printer lacks a polarization-controlling reflector for the reasons stated above with reference to Claim 2.

(b) Claims 23-28

The applicant respectfully submits that the rejection of Claims 23-28 that depend on Claim 22 is improper on the grounds that the prima facie case of obviousness set forth in the official action with respect to Claims 23-28 does not comply with the requirements set forth in MPEP § 2143. The applicant respectfully submits that the rejection of Claims 23-28 is improper at least because the proposed combination of Cheng, Pan and Nishikawa on which the rejection of Claims 23-28 is based is improper for the reasons stated above. Additionally, the applicant respectfully submits that the rejection of Claims

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23-28 is improper at least because the proposed combination of Cheng, Pan and Nishikawa neither teaches nor suggests all the claim limitations recited in Claims 23-28, also for the reasons set forth above with reference to Claim 22.

(c) Claims 23-25

With regard to claims 23-25, the official action states:

[O]nce account is taken of the fact that both a first one and a second one of said plurality of states of said reflective element can be a non-off state, the optical device of combination meets the limitations recited in these claims. See above and Fig. 4 of Cheng (the designation of ports as being first input, second input, etc., being arbitrary).

The applicant respectfully submits that the rejection of claims 23-25 is improper because the official action does not indicate a correspondence between the limitations recited in claims 23-25 and elements of the proposed combination of references.

(d) Claim 27

With reference to claim 27, the official action states that the polarization stage of the combination comprises a birefringent element (18). The applicant respectfully disagrees. As noted above, Cheng describes his element 18 as a lens, preferably a GRIN lens. The applicant has been unable to find any indication in Cheng's disclosure of element 18 having birefringent properties.

Accordingly, the applicant respectfully submits that the rejection of Claim 27 is improper for the additional reason that the proposed combination of references neither teaches nor suggests every claim limitation recited in Claim 27.

2. OBVIOUSNESS-TYPE DOUBLE PATENTING REJECTIONS

*D. Is the rejection of Claims 2-20, 22-28, and 30-33 under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims 1-15 of United States patent no. 6,690,854 of Helbing proper?*

Claims 2-20, 22-28, and 30-33 are rejected under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims 1-15 of Helbing.

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The official action states:

Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter disclosed therein is sufficiently similar to subject the claims of the instant application to obviousness-type double patenting rejection. Compare, for the sake of example, claim 2 of the instant application with claim 1 of [Helbing], it being submitted that the WDM device disclosed in [Helbing] reads on the generic optical device denomination set forth in, for example, claim 2 of the instant application.

MPEP § 804 II B 1 summarizes the legal requirements for an obviousness-type double patenting rejection as follows:

A double patenting rejection of the obviousness-type is "analogous to [a failure to meet] the nonobviousness requirement of 35 USC § 103" except that the patent principally underlying the double patenting rejection is not considered prior art. *In re Braithwaite*, 379 F.2d 594, 154 USPQ 29 (CCPA 1967). Therefore, any analysis employed in an obviousness-type double patenting rejection parallels the guidelines for analysis of a 35 USC § 103 obviousness determination. *In re Braat*, 937 F.2d 589, 19 USPQ2d 1289 (Fed. Cir. 1991); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985).

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Any obviousness-type double patenting rejection should make clear:

(A) The differences between the inventions defined by the conflicting claims - a claim in the patent compared to a claim in the application; and

(B) The reasons why a person of ordinary skill in the art would conclude that the invention defined in the claim in issue is an obvious variation of the invention defined in a claim in the patent.

When considering whether the invention defined in a claim of an application is an obvious variation of the invention defined in the claim of a patent, the disclosure of the patent may not be used as prior art.

The applicant respectfully submit that the obviousness-type double patenting rejection set forth in the third official action does not meet the legal requirements for an obviousness-type double patenting rejection summarized in MPEP § 804 II B 1.

The official action does not indicate the differences between the inventions defined by the conflicting claims - a claim in the patent compared to a claim in the application. The official action simply suggests comparing Claim 2 with claim 1 of Helbing. Even with respect to Claim 2 and claim 1 of Helbing, the official action does not point out differences and does not provide reasons why a person of ordinary skill in the



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art would conclude that the invention defined in Claim 2 is an obvious variation of the invention defined in Helbing's claim 1. Moreover, the official action appears to refer to the specification of Helbing, which is specifically prohibited by MPEP § 804 II B 1.

The official action does not make clear the differences between Claims 3-20, 22-28 and 30-33 and claims of Helbing's patent. Nor does the official action indicate reasons why a person of ordinary skill in the art would conclude that the invention defined in each claim in issue is an obvious variation of the invention defined in the corresponding claim of Helbing's patent without using the disclosure of Helbing's patent as prior art.

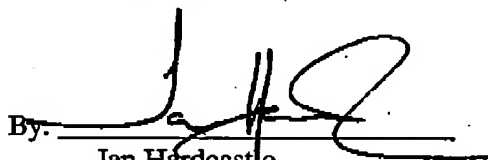
Accordingly, the applicant respectfully submits that the rejection of Claims 2-20, 22-28, and 30-33 under the judicially-created doctrine of obviousness-type double patenting is improper because the official action does not set forth a proper prima facie case of the obviousness-type double patenting.

#### Conclusion

The applicant respectfully submit that, for the reasons of fact and law set forth above, the decision of the Examiner in finally rejecting claims 2-20, 22-28 and 30-33 should be reversed.

Respectfully submitted,

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**VIII. Claims Appendix**

The claims on appeal and their status are:

1. (cancel)

2. (previously presented) An optical device, comprising:

a polarization-controlling reflector, said reflector converting incident-light polarization components having incident angles of polarization into reflected-light polarization components having reflected angles of polarization, said reflector having a plurality of states, and being controllable such that said reflector can be changed from one of said plurality of states to another of said plurality of states, said reflected angles of polarization having an orientation relative to said incident angles of polarization, said orientation being a function of the state of the reflector; and

a polarization-dependent optical-path device, said polarization-dependent optical-path device converting input-light polarization components that are at least partially spatially-coincident and that have been coupled into the optical device into spatially-separated input-light polarization components, said polarization-dependent optical-path device converting said spatially-separated input-light polarization components into said spatially-separated incident-light polarization components, and wherein when said reflector is in a first one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of the reflected-light polarization components to be out-coupled from the optical device,

wherein said polarization-dependent optical-path device includes an input polarization-dependent path splitting element, the input polarization-dependent path splitting element converting said input-light polarization components that are at least partially spatially-coincident into said spatially-separated input-light polarization components, thereby defining a branched input.

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3. (original) The optical device of claim 2, wherein said polarization-dependent optical-path device includes an output polarization-dependent path splitting element, and wherein prior to said polarization-dependent optical-path device converting said spatially-separated reflected-light polarization components having reflected angles of polarization into said output-light polarization components that are at least partially spatially-coincident, said output polarization-dependent path splitting element converts said spatially-separated reflected light components having reflected angles of polarization into spatially-separated reflected-light components having output angles of polarization, thereby defining a branched output, said output angles of polarization depending on the state of the reflector, wherein when said reflector is in said first one of said plurality of states, at least a portion of said output-light polarization components is out-coupled from the optical device through said branched output, and wherein the portion of said output-light polarization components that is out-coupled from the optical device through said branched output depends on the state of said reflector.

4. (original) The optical device of claim 3, wherein when said reflector is in a second one of said plurality of states, at least a portion of said output-light polarization components is out-coupled from the optical device through said branched output and at least a portion of said output-light polarization components is out-coupled from the optical device through said branched input, and wherein the portion of said output-light polarization components that is out-coupled from the optical device through said branched output and the portion of said output-light polarization components that is out-coupled from the optical device through said branched input depends on the state of said reflector.

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5. (original) The optical device of claim 3, wherein said plurality of states constitutes a continuum of states such that said optical device functions as an analog optical device, and wherein the respective portions of output-light polarization components that are out-coupled from the optical device through said branched input and through said branched output is controllably variable over a continuum of said portions by selecting the state of the reflector from said continuum of states.

6. (original) The optical device of claim 3, wherein said polarization-dependent optical path device includes a polarization-dependent combiner element, and wherein after said output polarization-dependent path splitting element converts said spatially-separated reflected light components having reflected angles of polarization into spatially-separated reflected-light components having output angles of polarization, the polarization-dependent combiner converts said spatially-separated reflected-light polarization components having output angles of polarization into said output-light polarization components that are at least partially spatially-coincident.

7. (previously presented) The optical device of claim 3, wherein said polarization-dependent optical path device includes a polarization-dependent combiner element, and wherein after said output polarization-dependent path splitting element converts said spatially-separated reflected light components having reflected angles of polarization into spatially-separated reflected-light components having output angles of polarization, the polarization-dependent combiner converts said spatially-separated reflected-light polarization components having output angles of polarization into output-light polarization components that are orthogonal to each other.

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8. (original) The optical device of claim 3, wherein when said reflector is in a third one of said plurality of states, the optical device functions as a beam splitter and approximately half of the output-light polarization components are out-coupled from the optical device through said branched output and approximately half of the output-light polarization components are out-coupled from the optical device through said branched input.

9. (previously presented) The optical device of claim 2, wherein the input-light polarization components coupled into the optical device and the reflected-light polarization components out-coupled from the optical device at least partially share a common optical path within the optical device.

10. (previously presented) The optical device of claim 2, wherein the input-light polarization components coupled into the optical device propagate along at least one input optical path of the optical device and the reflected-light polarization components are out-coupled from the optical device via at least one output optical path of the optical device, the at least one output optical path being distinct from the at least one input optical path.

11. (original) An optical device comprising:

a polarization-controlling reflector, said reflector converting a first set of spatially-separated incident-light polarization components having incident angles of polarization into a first set of spatially-separated reflected-light polarization components having reflected angles of polarization and converting a second set of spatially-separated incident-light polarization components having incident angles of polarization into a second set of spatially-separated reflected-light polarization components having reflected angles of polarization, the incident angles of polarization of said first set of incident-light polarization components being different from the incident angles of polarization of said second set of incident-light polarization components, the reflected angles of polarization

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of said first set of spatially-separated reflected-light polarization components being different from the reflected angles of polarization of said second set of spatially-separated reflected-light polarization components, said reflector having a plurality of states and being controllable such that said reflector can be changed from one of said plurality of states to another of said plurality of states, the reflected angles of polarization having orientations relative to their respective incident angles of polarization, said orientations being a function of the state of the reflector; and

a polarization-dependent optical-path device having at least a first input port, a first output port, a second input port and a second output port, said polarization-dependent optical-path device converting a first set of input-light polarization components that are at least partially spatially-coincident and that have been coupled into the first input port of the optical device into a first set of spatially-separated input-light polarization components and converting a second set of input-light polarization components that are at least partially spatially-coincident and that have been coupled into the second input port of the optical device into a second set of spatially-separated input-light polarization components, said polarization-dependent optical-path device converting said first set of spatially-separated input-light polarization components into said first set of spatially-separated incident-light polarization components and converting said second set of spatially-separated input-light polarization components into said second set of spatially-separated incident-light polarization components, and wherein when said reflector is in a first one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said first set of reflected-light polarization components to be out-coupled from the optical device through said first output port.

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12. (original) The optical device of claim 11, wherein when said reflector is in said first one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said second set of reflected-light polarization components to be out-coupled from the optical device through said second output port.

13. (original) The optical device of claim 12, wherein when said reflector is in a second one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said first set of reflected-light polarization components to be out-coupled from the optical device through said second output port.

14. (original) The optical device of claim 12, wherein when said reflector is in a second one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said second set of reflected-light polarization components to be out-coupled from the optical device through said first output port.

15. (original) The optical device of claim 11, wherein said polarization-dependent optical-path device includes an input polarization-dependent path splitting element, the input polarization-dependent path splitting element converting said first set of input-light polarization components that are at least partially spatially-coincident into said first set of spatially-separated input-light polarization components and converting said second set of input-light polarization components that are at least partially spatially-coincident into said second set of spatially-separated input-light polarization components, said first and second sets of said spatially-separated input-light polarization components propagating along a common optical path of the optical device from the first input port.

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16. (original) The optical device of claim 11, wherein said polarization-dependent optical-path device includes an input polarization-dependent path splitting element, the input polarization-dependent path splitting element converting said first set of input-light polarization components that are at least partially spatially-coincident into said first set of spatially-separated input-light polarization components and converting said second set of input-light polarization components that are at least partially spatially-coincident into said second set of spatially-separated input-light polarization components, said first set of said spatially-separated input-light polarization components propagating along a first optical path of the optical device from the first input port and said second set of said spatially-separated input-light polarization components propagating along a second optical path of the optical device from the first input port, the first optical path being distinct from the second optical path.

17. (original) The optical device of claim 11, wherein said polarization-dependent optical-path device includes an output polarization-dependent path splitting element, and wherein prior to said polarization-dependent optical-path device converting said first and second sets of spatially-separated reflected-light polarization components into said first and second sets, respectively, of output-light polarization components that are at least partially spatially-coincident, said output polarization-dependent path splitting element converts said first set of spatially-separated incident-light components having incident angles of polarization into a first set of spatially-separated reflected-light components having reflected angles of polarization that are different from said incident angles of polarization of said first set of spatially-separated incident-light components, and converts said second set of spatially-separated incident-light components having incident angles of polarization into a second set of spatially-separated reflected-light components having reflected angles of polarization that are different from said incident angles of polarization of said second set of spatially-separated incident-light components, said reflected angles of polarization of said first and second sets of spatially-separated reflected-light polarization components



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depending on said state of the reflector, wherein when said reflector is in said first one of said plurality of states, at least a portion of said first set of output-light polarization components is out-coupled from the optical device through said first output port.

18. (original) The optical device of claim 17, wherein when said reflector is in said first one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said second set of output-light polarization components to be out-coupled from the optical device through said second output port.

19. (original) The optical device of claim 18, wherein when said reflector is in a second one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said first set of output-light polarization components to be out-coupled from the optical device through said second output port.

20. (original) The optical device of claim 18, wherein when said reflector is in a second one of said plurality of states, said orientation is such that said polarization-dependent optical-path device causes at least a portion of said second set of output-light polarization components to be out-coupled from the optical device through said first output port.

21. (cancelled)

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22. (original) An integrated optical device comprising:

at least a first input port;

at least a first output port;

a substantially non-reciprocal directional stage comprising one or more elements that are configured to operate on polarization components of light, the directional stage receiving light from at least the first input port, the received light having polarization components, the directional stage controlling a path of propagation of the received light through the directional stage by operating on the polarization components of the received light;

a reflective element having a plurality of states such that light impinging on the reflective element is reflected by the reflective element with a polarization that depends on the state of the reflective element; and

a polarization stage interposed between the directional stage and the reflective element, the polarization stage directing the polarization components of light propagating through the directional stage onto the reflective element by operating on the polarization components of the light received by the polarization stage from the directional stage, and wherein the polarization stage directs light components reflected from the reflective element into the directional stage with a polarization that depends on the state of the reflective element to enable the directional stage to control the path of propagation of the reflected light based on the polarization of the reflected light components.

23. (original) The integrated optical element of claim 22, wherein when the reflective element is in a first one of said plurality of states, at least a fraction of the reflected light is out-coupled from the integrated optical device through the first output port and at least substantially none of the reflected light is output from the integrated optical device through the first input port.

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24. (original) The integrated optical element of claim 23, further comprising a second output port, and wherein when the reflective element is in a second one of said plurality of states, at least a fraction of the reflected light is out-coupled from the integrated optical device through the second output port and at least substantially none of the reflected light is output from the integrated optical device through the first input and first output ports.

25. (original) The integrated optical element of claim 23, further comprising a second input port, wherein light received by said substantially non-reciprocal directional stage from the second input port has polarization components, the directional stage controlling the path of propagation of the light received from the second input port through the directional stage by operating on the polarization components of the light received through the second input port, and wherein the light received through the second input port is reflected by the reflective element with a polarization that depends on the state of the reflective element, and wherein when the reflective element is in a second one of said plurality of states, at least a fraction of the reflected light corresponding to light received through the first input port is out-coupled from the integrated optical device through the second output port and at least a fraction of the light received through the second input port is out-coupled through the first output port.

26. (original) The integrated optical device of claim 22, wherein the directional stage comprises one or more walk-off crystals and one or more Faraday rotators for manipulating the polarization components of the light received through the first input port.

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27. (original) The integrated optical device of claim 22, wherein the polarization stage comprises at least one birefringent element that directs polarization components of light received from the directional stage onto the reflective element in a manner dictated by the polarization components of the received light and by a configuration of said at least one birefringent element, and wherein the polarization stage directs light reflected from the reflective element into the directional stage in a manner dictated by the polarization components of the reflected light and by the configuration of said at least one birefringent element, thereby causing the polarization stage to function as a polarizing beam splitter that directs reflected light into an appropriate side of the directional stage.

28. (original) The integrated optical device of claim 22, wherein the reflective element is a liquid crystal cell.

29. (cancelled)

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30. (previously presented) A method for operating on light, the method comprising:

providing an optical device comprising a polarization-dependent optical path device and a controllable reflective element that has a plurality of states, said polarization-dependent optical-path device including an input polarization-dependent path splitting element, the input polarization-dependent path splitting element spatially separating said input-light polarization components to obtain said spatially-separated input-light polarization components, thereby defining a branched input;

coupling input light into the optical device;

using the polarization-dependent optical path device to separate the input light into spatially-separated input-light polarization components;

using the polarization-dependent optical path device to provide the polarization components with incident angles of polarization and to direct the polarization components onto the reflective element;

placing the reflective element in one of said plurality of states, wherein the reflective element reflects the input-light polarization components incident thereon, thereby producing reflected-light polarization components having reflected angles of polarization, the reflected angles of polarization depending on the state of the reflective element; and

using the polarization-dependent optical path device to combine the reflected-light polarization components, the combined reflected-light polarization components being out-coupled from the optical device.

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31. (original) The method of claim 30, wherein said polarization-dependent optical path device includes an output polarization-dependent path splitting element, said output polarization-dependent path splitting element converting said reflected-light polarization components having reflected angles of polarization into spatially-separated reflected-light polarization components having reflected angles of polarization, thereby defining a branched output, said reflected angles depending on the state of the reflective element, wherein when said reflector is in a first one of said plurality of states, at least a portion of said combined reflected-light polarization components is out-coupled from the optical device through said branched output, and wherein the portion of the out-coupled light components that is out-coupled from the optical device through said branched output depends on the state of said reflector.

32. (original) The method of claim 31, wherein when said reflective element is in a second one of said plurality of states, at least a portion of the combined reflected-light polarization components is out-coupled from the optical device through said branched output and at least a portion of said output-light polarization components is out-coupled from the optical device through said branched input, and wherein the portion of the polarization components that is out-coupled from the optical device through said branched output and the portion of the polarization components that is out-coupled from the optical device through said branched input depends on the state of said reflective element.

33. (original) The method of claim 31, wherein said plurality of states constitute a continuum of states such that said optical device functions as an analog optical device, and wherein the respective portions of polarization components that are out-coupled from the optical device through said branched input and through said branched output are variable over a continuum of said portions by controllably selecting the state of the reflective element from said continuum of states.